

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Mechanism for Inserting Coils into Grooves of the Stators of Electric Machines

We, VEB ELEKTROMAT, a Corporation organised and existing under the laws of Eastern Germany of Karl-Marx-Strasse, DDR-808 Dresden, East Germany, do hereby declare the invention for which we pray that a Patent may be granted to us and the method by which it is to be particularly described in and by the following statement:—

10 The invention relates to a mechanism for inserting coils into grooves of the stators of electric machines, comprising a reciprocable wire guiding mechanism inserted through the bore of the stator.

15 There is already a conventional mechanism, wherein the coils are inserted into the grooves of stators of electric machines, by means of alternate rocking levers, which guide the wire and which are swivel mounted on a reciprocable winding arm. By means of cam guides, which are located outside the winding arm, the rocking levers are deflected and hence the wire is moved towards the base of the groove. 25 At the same time the ends of the coils are formed over wire supporting elements by a relative movement between the winding arm and stator. In spite of the advantage that this mechanism permits the simultaneous insertion of several coils into the grooves of the stators, it has however, also some drawbacks.

For example, the wire is placed in a loop onto the wire supporting elements during the formation of the coil ends and is then jerkily pulled back into the grooves of the stator by means of a wire withdrawal implement. Thereby the wire insulation or the wire itself might be damaged. Since the 40 wire is released from the rocking levers during the loop formation, the wire cannot be

precisely guided. In addition thereto it is not possible with this mechanism to insert thicker wires at substantial winding speeds without damaging the same. The use of only one guide roller in the cam guides during the deflecting process entails wear of all guide elements and hence susceptibility to trouble with such mechanisms. Finally, this mechanism requires for every new type of stator a winding aggregate which is suitable for this particular type. 45 50

In another known mechanism the wire is inserted into the grooves of the stator by a rotating endless roller chain, which is insertable into the bore of the stator, over conical coil-end-forming-elements. The roller chain is guided in recesses of a chain carrier member and the wire is taken up by a guide needle, secured to the roller chain, and hence follows the rotating movement. In spite of the advantage that the mass of the roller chain, which serves as a winding member, is very small and hence there is the possibility of achieving relatively high winding speeds, and furthermore of a certain adaptability of the mechanism, within limits, for various stator types, this mechanism also shows some disadvantageous features. 55 60 65 70

When the wire leaves the guide needle it forms a very small bending radius, which might easily cause the wire to kink, particularly the thicker wires, and hence damage the wire insulation or the wire itself. In addition thereto this mechanism is not fully satisfactory as far as the formation of the coil ends and the filling of the grooves are concerned. Especially disadvantageous is the laborious changing of the stators and the fact that only one coil can 75 80

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be inserted at a time. Hence the advantage of the high winding speed is annulled.

It is the object of the invention to reduce the wear of the wire guiding mechanisms to a minimum and to achieve a continuous and damage-free insertion of thick wires into the grooves of various types of stators.

The invention provides a mechanism for inserting coils into grooves of stators of electric machines, which is equipped with a roller chain as a winding member and which permits precise guiding of the wire during the insertion process of the same.

The roller chain consists of a chain element with conventional wire guiding mechanisms, the former being located in a cam track extending through the bore of the stator and being approximately radial and opposite to the stator.

The chain element either consists of a roller chain portion which is provided with a shuttle, serving as a wire guiding element, and two wire guiding rollers located therein, which partly extend beyond the shuttle in order to be insertable into the grooves of the stator or else of two or more roller chain portions, between which the shuttle is mounted. In order to be able to use the mechanism for various stator sizes, the cam track is movably attached to an anchoring means and is located vertically to the axis of the stator. For the purpose of changing the stators the cam track is divided in a vertical plane transverse to the axis of the stator, and hence both parts are reciprocally movable. The preferably closed cam track is, due to manufacturing reasons, divided in a vertical plane in the direction of the axis of the stator. In addition thereto the cam track is provided with a bridge, which, dependent upon the width of the stator, has various lengths and is exchangeably connected to the cam track by means of conventional anchoring elements. Especially when the stators are long, this results in a considerable reduction of idle time, when exchanging the stators. The chain element meshes with a toothed rod, which is exchangeably mounted on a winding arm which is reciprocable in axial direction of the stator.

For particularly large bores in stators it is advantageous to drive the chain element by chain sprockets which revolve in synchronism and are arranged opposite to the stators in the cam track. In the event of using roller chain portions with a fitted shuttle as a chain element, the guiding is preferably effected by roller bearings located outside the chain side plates and in the chain bolts. However, chain elements consisting of two or more parallel roller chain portions are preferably guided by the rollers of the chains themselves.

The mechanism according to the invention is suitable for the insertion of one coil or also for the simultaneous insertion of several coils into the grooves of a stator, whereby one chain element is used for each coil to be inserted and is mounted and driven in a cam track.

The invention is hereinafter further explained with reference to an example. In the corresponding drawings are:—

Fig. 1 the schematic illustration of a mechanism for inserting coils into grooves of the stators of electric machines,

Fig. 2 the front view of a wire guiding mechanism according to the invention (partly in sectional view).

Fig. 3 a side view of Fig. 2.

As can be seen from Fig. 1 the mechanism comprises a frame 1, housing conventional driving means and on whose table 2 there are provided a stator carrier 3 and a wire guiding mechanism for the insertion of a coil.

The wire guiding mechanism is composed of four cam track portions 4, a winding member and a toothed rod 5. In order to clarify the drawing two of the cam track portions 4 are not illustrated in Fig. 2. The cam track portions 4 are provided with tracks 6 with dimensions determined by the diameter and width of the roller bearings 7. The course of these tracks 6 depends upon the deflection which is required to lead a wire 8 over another winding 9. Each opposed pair of the cam track portions 4, is connected by means of a conventional connection member (not illustrated in the drawing), located in bores 11 in spacers 10. By means of openings 12, provided in the front ends of the cam track portions 4, these are movable vertically to the axis of a stator 13 and are mounted on anchoring means 14. It is however understood that the opening 12 may also be provided in the anchoring means 14. A bridge 15, having the same profile as the tracks 6, is exchangeably connected to projections 16, of the cam track portions 4 by means of conventional members. As an alternative it is also possible, preferably in short stators 13, to connect the track portions 4 by longer constructed projections 16.

The winding member consists of roller chain portions 17 and 17a and a shuttle 18, whereby the two items are connected by connection elements 19. The shuttle 18 is provided with wire guiding rollers 21 mounted in bearings 20, which rollers partly project beyond the shuttle 18, in order to be insertable into the grooves 22 of a stator 13. The roller bearings 7 are provided with bearings for the chain pivots 24 connecting the chain plates 23 to guide the winding member in the tracks 6.

The toothed rod 5 is mounted on a re-

ciprocable winding arm 25 which is provided with a wire nozzle 26 and can be exchanged as required. The winding arm 25 has an opening through which the wire 8 is led and into which the shuttle 18 extends. The winding arm 25 is connected to a drive 28 for the said winding arm.

The operating of the mechanism is as follows:— After the insertion of a stator 13 into the stator carrier 3 the cam track portions 4 are moved towards each other and are connected by a bridge 15. During this operation the roller chain portion 17 and the shuttle 18 are completely in the pair of cam track portions 4, and are driven from the drive lever 28. The movement of the winding arm 25, and of the toothed rod 5 mounted thereon, in the direction of the cam portions 4 causes the roller chain portion 17 to be moved by a sprocket wheel or the like (not shown) and hence a wire 8 coming from a wire nozzle 26 of the shuttle 18 is placed into the groove 22 of the stator 23. On the front end of the stator carrier 3 opposite the drive lever 28, the roller chain portion 17 with the shuttle 18 is deflected by the shape of the tracks 6 over the windings 9. Following this a relative turning motion between stator carrier 3 and wire guiding mechanism places the wire exactly over the windings 9. The relative turning motion is either effected with a rigid stator carrier and a rotatable wire guiding mechanism or by means of a pivotable stator carrier 3 and a reciprocable wire guiding mechanism. After the winding arm 25 has returned, whereby the wire 8 was inserted into the groove 22 of the stator, depending on the pitch of the winding, there is another relative movement which is opposite to the first one and which completes the loop formation. This operation is repeated until the required number of loops for the coil formation has been achieved.

45 WHAT WE CLAIM IS:—

1. Mechanism for inserting coils into grooves of the stators of electric machines comprising a reciprocable wire guiding mechanism inserted through the bore of the stator, which comprises at least one drivable roller chain having wire guiding elements, which insert the wire into the grooves of a stator, characterised in that the roller chain consists of a chain element with guiding

means, said chain element being located in a cam track extending through the bore of the stator. 55

2. Mechanism according to Claim 1 characterised in that the chain element consists of a roller chain portion provided with a shuttle, serving as a wire guiding element, and two wire guiding rollers located therein, which, partly project outside the shuttle. 60

3. Mechanism according to Claim 1 characterised in that the chain element comprises two roller chain portions with a shuttle located between adjacent ends thereof serving as a wire guiding element. 65

4. Mechanism according to Claim 1 characterised in that the cam track is radially movable relative to the axis of the stator. 70

5. Mechanism according to Claim 1 characterised in that the cam track is divided in a vertical plane transverse to the axis of the stator and that both parts are reciprocally movable. 75

6. Mechanism according to Claim 1 characterised in that a closed cam track is provided which divided in a vertical plane transverse to the axis of the stator. 80

7. Mechanism according to Claims 1 and 5 characterised in that the cam track is provided with an exchangeable bridge whose dimensions are variable according to the width of the stator. 85

8. Mechanism according to Claims 1 to 3 characterised in that the chain element meshes with a toothed rod which is exchangeably located on a winding arm the latter being reciprocable in axial direction of the stator. 90

9. Mechanism according to Claims 3 and 6 characterised in that the roller chain portion is provided with roller bearings projecting beyond the chain plates of the chain. 95

10. Mechanism for inserting coils into grooves of stators in electrical machines substantially as described and illustrated herewith reference to the accompanying drawings. 100

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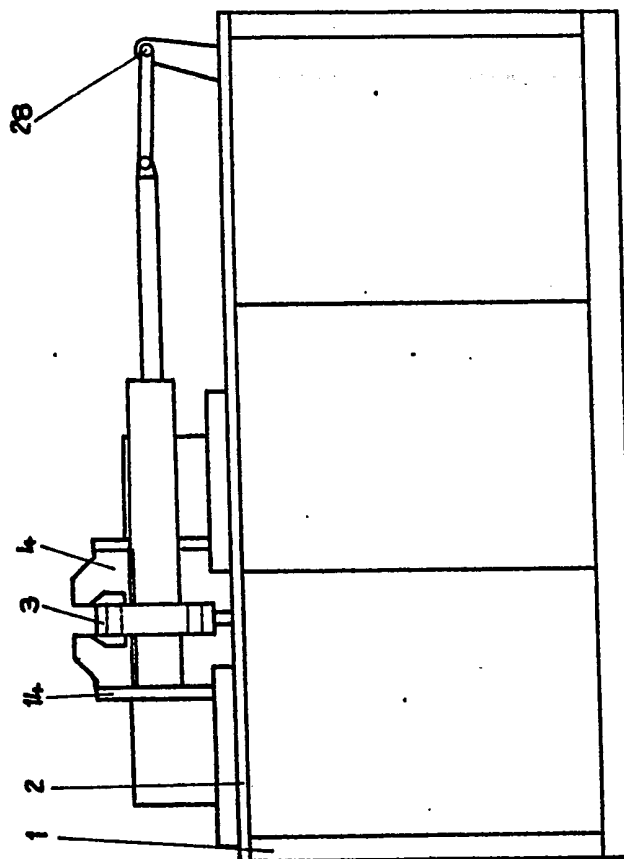
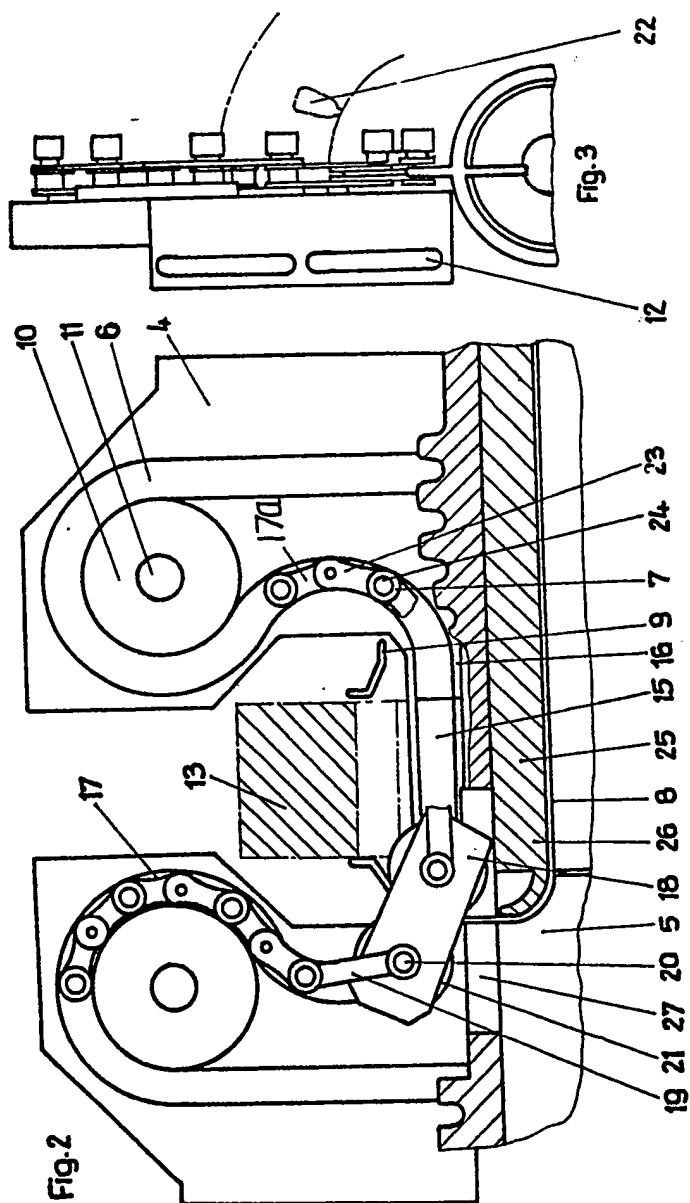


Fig. 1



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